# Fermilab's Program to Manage Low Levels of Tritium in Surface Water

*Indian Creek*

## Overview

In November 2005, Fermilab's regular environmental monitoring program detected low levels of tritium in ponds on the Fermilab site and in Fermilab's Indian Creek. This is the first time tritium has been detected in these surface waters. The levels found are far lower than the federal water standards that Fermilab is required to meet. Fermilab is committed to keeping releases of tritium via water discharges well below the required limits. We have taken steps to keep the levels as low as reasonably achievable, both now and in the future.

## What is tritium?

Tritium is a weakly radioactive isotope of the element hydrogen with a half-life of 12.3 years. Tritium emits low-energy particles that cannot penetrate the skin. People could be harmed by tritium only through internal exposure caused by regularly drinking water with high levels of tritium over many years. Tritium is produced at Fermilab as a byproduct of accelerator operations. The low levels of tritium found in Indian Creek and in the Fermilab ponds come from the NuMI/MINOS experiment begun in February 2005.

## Does this tritium constitute a health risk to Fermilab neighbors?

No. The levels found in Indian Creek are extremely low compared to what is safe for a lifetime of continuous exposure to tritium in surface water. The table on page 2 illustrates how tritium concentrations found at Fermilab compare to safe concentrations in surface water. The levels are specified in picocuries (pCi, the amount of radiation produced) per milliliter (ml, metric volume) of water. The regulatory standard for drinking water is also listed, even though the water leaving the Fermilab site poses no threat to drinking water.

## What actions has Fermilab taken?

1. In December 2005, **Fermilab identified the major contributor** to the tritium found in the Indian Creek discharge and the Fermilab ponds. In 2006, we **reduced by half the level of tritium** in the water pumped out of the NuMI/MINOS experimental halls. Fermilab then conducted an intensive investigation and, in early 2006, identified the origin of the majority of the remaining tritium produced by the NuMI/MINOS experiment. In Spring 2006, we installed additional equipment in the NuMI/MINOS halls to **minimize the amount of tritium** that reaches the surface waters at Fermilab.

2. Fermilab **consulted the Fermilab Community Task Force for Public Participation,** and the laboratory **informed neighbors and community organizations** of this issue**.**

3. **Fermilab has revised its water monitoring program** to gather more comprehensive results more often, with adjustments made as needed:
   - The three creeks leaving the Fermilab site (Indian Creek, Kress Creek and Ferry Creek) are being monitored regularly and all results are posted on the Web at *http://www.fnal.gov/pub/about/community/creekhub.html*
   - Ponds on the Fermilab site that could release water into these creeks are monitored frequently.
   - The Illinois Environmental Protection Agency has confirmed the accuracy of Fermilab's measurement by performing independent measurements.

| A Guide to Concentrations of Tritium at Fermilab | | |
|---|---|---|
| Federal Surface Water Standards (These are the standards that apply to Indian Creek and Fermilab ponds.) | 2,000 pCi/ml | Standard for continuous, safe external exposure to water, established by the U.S. Department of Energy |
| Federal Drinking Water Standards (Tritium from Fermilab does not affect drinking water.) | 20 pCi/ml | Standard for water safe to drink, established by the U.S. Environmental Protection Agency (EPA) |
| Tritium concentrations at Indian Creek outflow in November 2005, when tritum was first found in surface water | 3 pCi/ml | Highest level of tritium found to leave the Fermilab site. No tritium has been detected in Kress Creek and Ferry Creek. |
| Tritium concentrations in on-site ponds in November 2005 | 3 pCi/ml | Average levels of tritium found in surface water on site |
| Tritium concentrations at Indian Creek outflow since April 2006 | below detection limit | Level found in all samples taken since April 2006; occasional low-level discharges from on-site ponds could occur after heavy rain storms |
| Tritium concentrations in on-site ponds since Summer 2006 | 1-2 pCi/ml | Average levels found in surface water on site after corrective measures taken; many ponds show no dectectable levels of tritium. |
| Detection limit for tritium | 1 pCi/ml | Lower limit of detection achieved by standard tritium detection techniques |

4. The Fermilab director appointed a Surface Water Quality Task Force to monitor and evaluate the issue. The Surface Water Quality Task Force coordinated steps to **minimize discharges of water** from the Fermilab site. Occasional low-level discharges, especially after heavy rain storms, with low levels of tritium may still occur.

5. Since 2006, Fermilab has implemented long-term strategies for minimizing tritium levels associated with high-intensity proton beams that produce tritium as a by-product.

6. Fermilab maintains a **Web site to keep its neighbors informed:** *http://www.fnal.gov/pub/about/community/IndianCreek.html*

## Fermilab's commitment to the public

**Fermilab is committed to go beyond merely satisfying the regulatory limits;** to reduce tritium discharges to levels as low as reasonably achievable; to keep the public fully informed; and to engage the public in the establishment of goals and formulation of plans.

## For further information

If you have any concerns or questions about this situation, please call Judy Jackson, Fermilab's Office of Public Affairs, at 630-840-3351 or go to *http://www.fnal.gov/pub/about/community/*

*Printed May 27, 2009*